What is claimed is:

1. A turbo decoder having a state metric, comprising:

branch metric calculation means for calculating a branch metric by receiving symbols through an input buffer;

state metric calculation means for calculating a reverse state metric by using the calculated branch metric at said branch metric calculating means, storing the reverse state metric in a memory, calculating a forward state metric; and

log likelihood ratio calculation means for calculating a log likelihood ratio by receiving the forward state metric from said state metric calculation means and reading the reverse state metric saved at a memory in said state metric calculation means.

2. The turbo decoder in recited as claim 1, wherein said state metric calculation means includes:

reverse state metric calculation means for calculating a reverse state metric in case an input i is 0 according to states of the branch metric; and

forward state metric calculation means for calculating a forward state metric in case an input i is 0 and i is 1 according to states of the branch metric.

3. A calculation method implemented to the turbo decoder, comprising steps of:

a) calculating a branch metric by receiving symbols;

b) calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;

c) calculating a forward state metric in case an input i is 0 and the input i is 1 by using the calculated branch metric;

d) calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and

e) storing the log likelihood ratio.

4. The calculation method as recited in claim 3, wherein the reverse state metric B_k^m, which is k^{th} reverse state metric with state *m*, is calculated by using an equation $\mathop{E}\limits_{j=0}^{7} (B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)})$, wherein *m* is a state of a trellis diagram; *k* is a stage; *j* is a $(k-1)^{th}$ input for a reverse state metric; *f(m)* is $(k+1)^{th}$ state related to k^{th} state with state *m*; *F(j,m)* is a function defined as *F(j,m)=f(m)* for *j=0* and *F(j,m) = s(f(m))* for *j=1*; *s(m)* is a function provides binary number of m with a most significant bit complemented; $\mathop{E}\limits_{j=0}^{7}$ is a function defined as $\mathop{E}\limits_{j=0}^{1} A_k^j = A_k^0 \; E \; A_k^1 = log_e(e^{A_k^0} + e^{A_k^0})$; $B_{k+1}^{F(j,m)}$ is a $(k+1)^{th}$ reverse state metric with state *F(j,m)* and $D_{k+1}^{j,f(m)}$ is *(k+1)th* branch metric with state *m* and $(k+1)^{th}$ input.

5. The calculation method as recited in claim 3, wherein the forward state metric A_k^m, which is k^{th} forward state metric with state *m*, is calculated by using an equation $\overset{1}{\underset{j=0}{E}}(D_k^{j,b(j,m)} + A_{k-1}^{b(j,m)})$ wherein *m* is a state of a trellis diagram; *k* is a stage; *b(j,m)* is a $(k-1)^{th}$ reverse state; *j* is a $(k+1)^{th}$ input for a reverse state metric; $\overset{1}{\underset{j=0}{E}}$ is a function defined as $\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 \, E \, A_k^1 = \log_e(e^{A_k^0} + e^{A_k^0})$; $A_{k-1}^{b(j,m)}$ is a $(k-1)^{th}$ forward state metric with state *b(j,m)*and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state *b(j,m)*.

6. The calculation method as recited in claim 3, wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^v-1}{\underset{m=0}{E}}(A_k^{1,m} + B_k^{s(m)}) - \overset{2^v-1}{\underset{m=0}{E}}(A_k^{0,m} + B_k^m)$ wherein *m* is a state of a trellis diagram; *k* is a stage; *j* is a $(k-1)^{th}$ input for a reverse state metric; *s(m)* is a function provides binary number of m with a most significant bit complemented; $\overset{1}{\underset{j=0}{E}}$ is a function defined as $\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 \, E \, A_k^1 = \log_e(e^{A_k^0} + e^{A_k^0})$; $A_k^{1,m}$ is a k^{th} forward state metric with state *m* and input *1*; $B_k^{s(m)}$ is a k^{th} reverse state metric with state *s(m)*; $A_k^{0,m}$ is a k^{th} forward state metric with state *m*

and input *0* and B_k^m is a k^{th} reverse state metric with state *m*.

7. The calculation method as recited in claim 3, wherein the reverse state metric B_k^m, which is k^{th} reverse state metric with state *m*, is calculated by using an equation $\underset{j=0}{\overset{1}{2}}\left(B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)} \right)$, wherein *m* is a state of a trellis diagram; *k* is a stage; *j* is a $(k-1)^{th}$ input for a reverse state metric; *f(m)* is $(k+1)^{th}$ state related to k^{th} state with state *m*; *F(j,m)* is a function defined as *F(j,m)=f(m)* for *j=0* and *F(j,m) = s(f(m))* for *j=1*; *s(m)* is a function provides binary number of m with a most significant bit complemented; $\underset{j=0}{\overset{1}{2}}$ is a function defined as $\underset{j=0}{\overset{1}{2}} A_k^j = A_k^0 \, 2 \, A_k^1 = \log_2(2^{A_k^0} + 2^{A_k^0})$; $B_{k+1}^{F(j,m)}$ is a $(k+1)^{th}$ reverse state metric with state *F(j,m)* and $D_{k+1}^{j,f(m)}$ is *(k+1)th* branch metric with state *m* and $(k+1)^{th}$ input.

8. The calculation method as recited in claim 3, wherein the forward state metric A_k^m, which is k^{th} forward state metric with state *m*, is calculated by using an equation $\underset{j=0}{\overset{1}{2}}\left(D_k^{j,b(j,m)} + A_{k-1}^{b(j,m)}\right)$ wherein *m* is a state of a trellis diagram; *k* is a stage; *b(j,m)* is a $(k-1)^{th}$ reverse state; *j*

is a $(k+1)^{th}$ input for a reverse state metric; $\overset{7}{\underset{j=0}{2}}$ is a function defined as $\overset{7}{\underset{j=0}{2}} A_k^j = A_k^0 \; 2 \; A_k^1 = log_2(2^{A_k^0} + 2^{A_k^0})$; $A_{k-1}^{b(j,m)}$ is a $(k-1)^{th}$ forward state metric with state $b(j,m)$ and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state $b(j,m)$.

9. The calculation method as recited in claim 3, wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^{v}-1}{\underset{m=0}{2}} (A_k^{1,m} + B_k^{s(m)}) - \overset{2^{v}-1}{\underset{m=0}{2}} (A_k^{0,m} + B_k^{m})$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k-1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of m with a most significant bit complemented; $\overset{1}{\underset{j=0}{2}}$ is a function defined as $\overset{1}{\underset{j=0}{2}} A_k^j = A_k^0 \; 2 \; A_k^1 = log_2(2^{A_k^0} + 2^{A_k^0})$; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^{m} is a k^{th} reverse state metric with state m.

10. A computer-readable recording medium storing instructions for executing a calculation method implemented to the turbo decoder, comprising functions of:

calculating a branch metric by receiving symbols;

calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;

calculating a forward state metric in case an input i is 0 and the input i is 1 by using the calculated branch metric;

calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and

storing the log likelihood ratio.